

MOTOR CONTROL

Contactors and Thermal Overload Relays

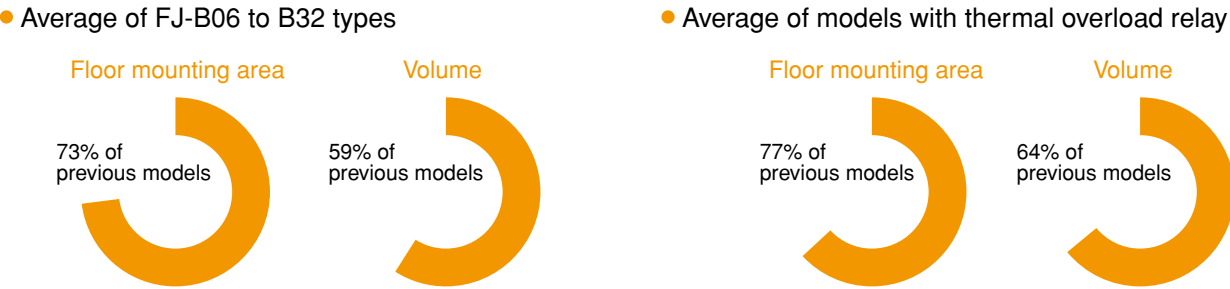
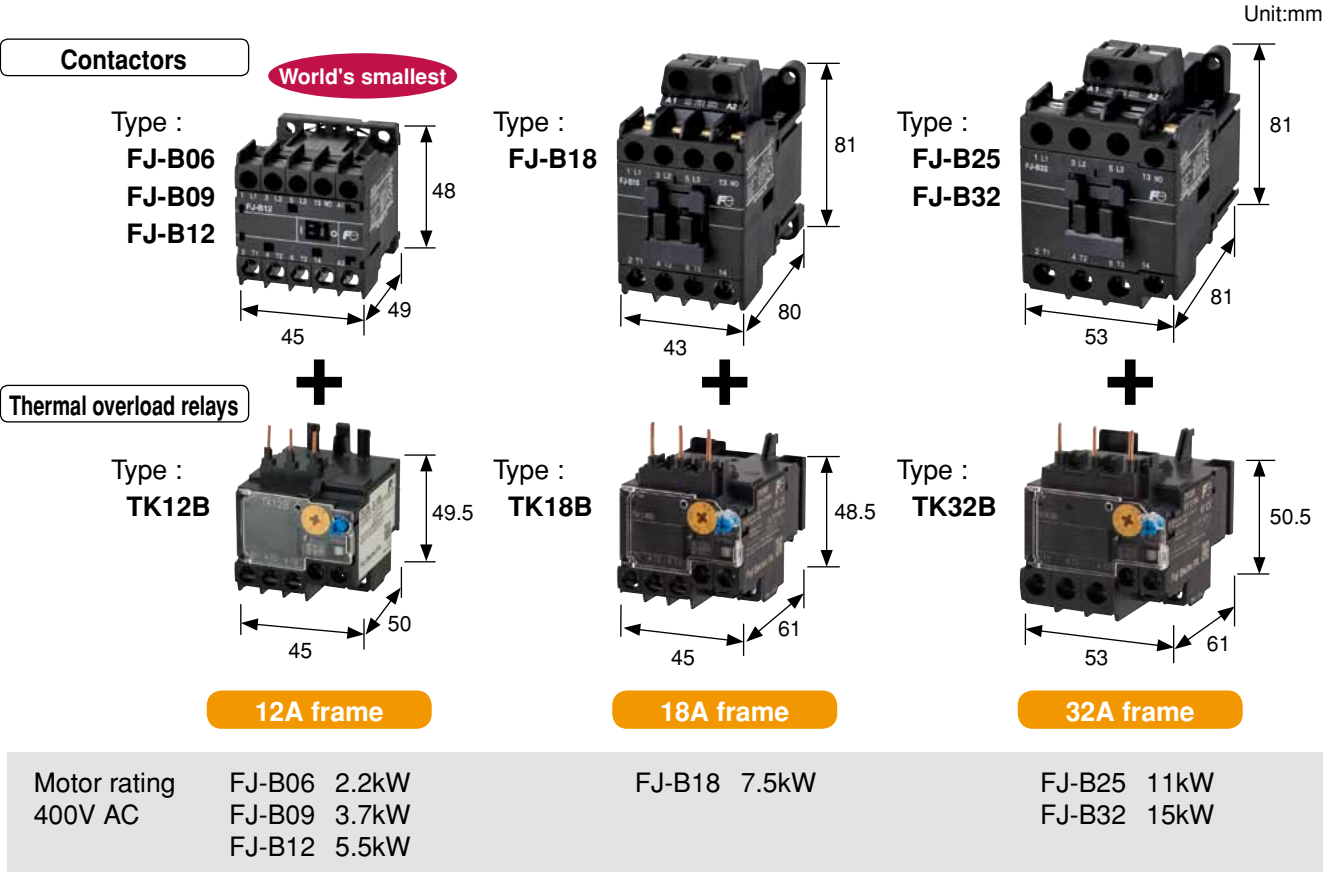
FJ Series



The FJ Series is compact, safety, environmental friendly and the world's smallest magnetic contactors.
(applied motor capacity: 400 VAC, 2.2 to 15 kW)

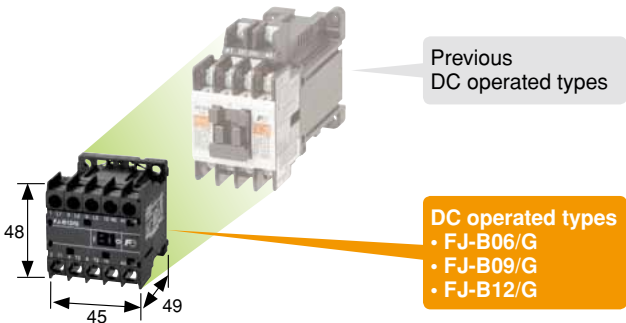
Compact

Compact and space-saving of magnetic contactor and thermal overload relay



Compact DC operated Contactor

- 6 to 12 A frame products have been made much smaller and lighter by adopting a newly developed electromagnet.



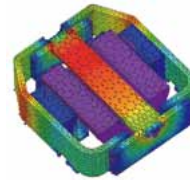
Highly efficient electromagnet has been developed by using a computer simulation with 3D magnetic field analysis so that AC and DC electromagnets have the same appearance. (FJ-B06, B09, and B12 types)

Developing DC electromagnet

- Developing compact and highly efficient electromagnet by using permanent magnet and making use of coil energy
- The DC electromagnet can be directly powered by 2.4 W through semiconductor output by minimizing the leaked magnetic flux, distributing optimized magnetic flux, and satisfying demand for both less loss and smaller size.



DC operated electromagnet
(FJ-B06/G, B09/G, and B12/G types)



Analyzing electromagnet
(distribution of magnetic flux density and magnetic flux flow)

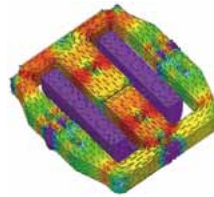
Developing AC electromagnet

- A compact electromagnet has been developed by optimizing the sectional area of each iron core part and excluding magnetic flux saturation and not having a wasteful shape
- The iron-core-fixing rivets are optimally arranged in order to remove the impact on magnetic flux route and the rivets can reduce eddy current loss.

This optimal design makes it possible to develop an energy saving electromagnet that has 4.5 VA of electromagnetic capacity.



AC operated electromagnet
(FJ-B06, B09, and B12 types)



Analyzing electromagnet
(distribution of magnetic flux density and magnetic flux flow)

Optimization was achieved through 3D thermal analysis and inversion mechanism simulation.

3D thermal analysis simulation

To increase the accuracy of overcurrent detection, the temperature rise in the built-in heater, the bimetal differential, and the interphase thermal interference must be known in detail.

To achieve this, interaction analysis of "current, heat transfer, bimetal differential" as shown in the Fig. 1 was performed. Through research of the most efficient heat transfer path, downsizing and reduction of power consumption for the heaters were achieved.

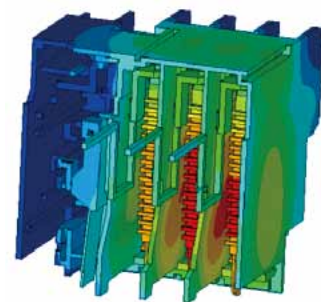


Fig. 1 3D Thermal Analysis Simulation

New inversion mechanism

To downsize the relays and to stabilize high-performance operating characteristics, a toggle inversion mechanism with a tension spring was used for the inversion mechanism as shown in the Fig. 2.

An inversion mechanism simulation was carried out on the tension spring which is the core of the inversion mechanism. The purpose was to verify that the input-output characteristics of the loads and variants as well as the space efficiency had been optimized.

In this way, the operating characteristics have been stabilized while the spring size has been minimized to reduce the necessary space.

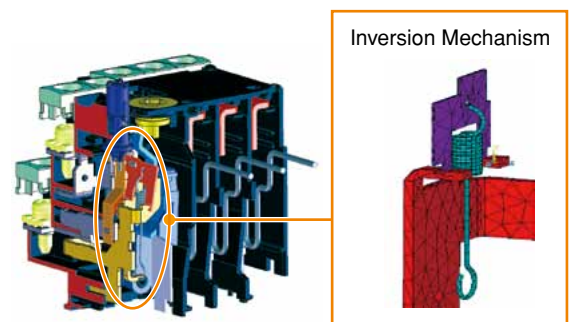


Fig. 2 Inversion Mechanism Simulation

Safety

Standards

Standard models of the FJ Series are certified by CCC and have obtained a CE mark, and that is shown on the nameplate of the main unit.



Terminal cover for finger protection

The terminal cover satisfies the requirements of Machinery Directive EN60204-1 "Direct Contact Prevention" concerning mechanical safety.



Magnetic contactor equipped with mirror contact

Mirror contact conforms to the requirement for auxiliary contact that is intended to be included in the future amendment to IEC 60947-4-1.

Mirror contact : Normally closed auxiliary contact, which cannot be in closed position simultaneously with the normally open main contact.

Ecology

Environmental friendly

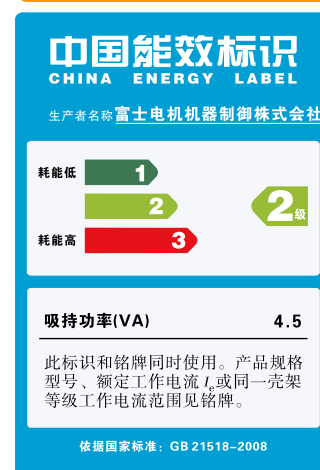
Compliant with RoHS directive (Restriction of Hazardous Substances in the EU)

The materials used do not contain any of the six substances that are specified in the RoHS Directive or have less than the specified content percentages of those substances.

China Energy Label

The FJ Series of magnetic contactors is highly energy efficient and they have met the specified value defined by the Energy Efficiency Label Management Method. Especially, FJ-B06, B09, and B12 types are energy saving with an energy efficiency class of 2.

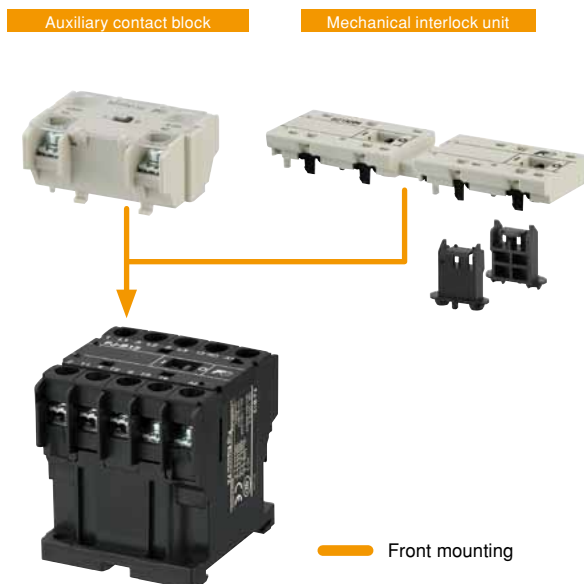
Energy Efficiency Label



Frame	06	09	12	18	25	32
Sealed VA	4.5	4.5	4.5	9	9	9
Class	2	2	2	3	3	3

Many options

Options for FJ-B06 to B12 types



Auxiliary contact block (front mounting) SZ1FA11 type, SZ1FA11H type



Auxiliary contact block with 2-pole or 4-pole contacts adopting a bifurcated contact. Easy to mount on a magnetic contactor.

Mechanical interlock unit SZ1KRW1W



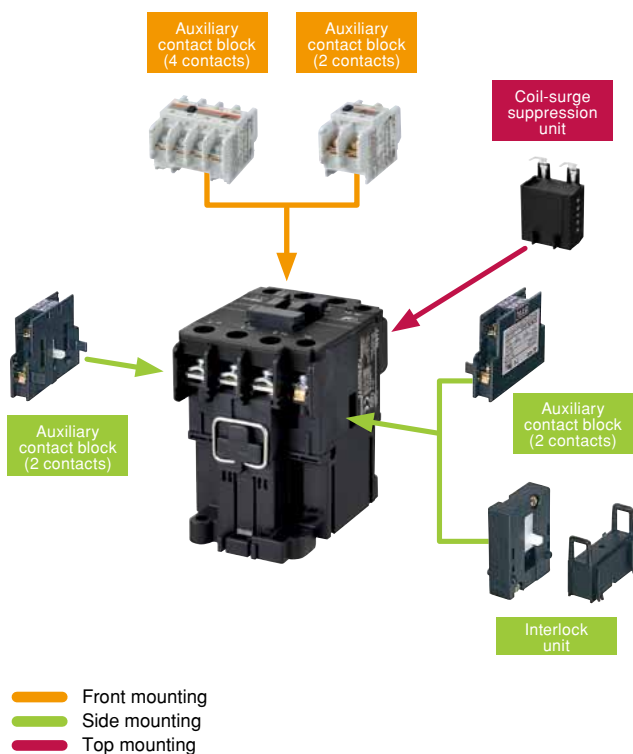
The mechanical interlock unit is used to interlock two contactors for reversing. One size fits all contactors.

Power Connection Kit for Reversing SZ1KRW1W



Cable kit for reversible circuit between main circuit terminals for two magnetic contactors.

Options for FJ-B18 to B32 types



Auxiliary contact block (front mounting) SZ-A□ type



Two and four auxiliary contact blocks adopting a bifurcated contact. Easy to mount on a magnetic contactor.

Auxiliary contact block (side mounting) SZ-A□ type

Auxiliary contact block with 2 (1NO1NC) contacts adopting a highly reliable auxiliary contact. Easy to mount on a magnetic contactor.

Interlock unit SZ-RM type



Two magnetic contactors are mechanically interlocked. Reversible and easy to assemble.







Coil-surge suppression unit SZ-Z□ type



Built-in surge voltage suppression elements (varistor, CR) while the coil is turned off.


List of Products












● Magnetic contactors



Series			FJ Series			
Frame			06	09	12	
Appearance						
Type	AC operated type		FJ-B06	FJ-B09	FJ-B12	
	DC operated type		FJ-B06/G	FJ-B09/G	FJ-B12/G	
Max. motor capacity (kW) AC-3, IEC60947-4-1	220/230V		1.5kW	2.2kW	3kW	
	380/400V		2.2kW	4kW	5.5kW	
	660/690V		2.7kW	4kW	5.5kW	
Operational current (A)	220/230V		6A	9A	12A	
	380/400V		6A	9A	12A	
	660/690V		3A	5A	6A	
Conventional free air thermal current (rated thermal current) Ith (A)			20A	20A	20A	
Auxiliary contact arrangement			1NO or 1NC	1NO or 1NC	1NO or 1NC	
Dimensions W × H × D (mm)	AC operated type		45 × 48 × 49			
	DC operated type					
Optional unit	Auxiliary contact block	Front mounting	SZ1FA11 or SZ1FA11H			
		Side mounting	—			
	Coil surge suppression unit *1		SZ1KZ1 to SZ1KZ5			
Standards			  			

Note: *1. Attach "S" behind the built-in order model of coil surge suppression unit.

● Thermal overload relays

Type			TK12B-□		
Appearance					
Protection function			Overload and phase loss		
Tripping class			10A		
Ampere setting range (A) / code			0.1-0.15 [P10] 0.13-0.2 [P13] 0.18-0.27 [P18] 0.24-0.36 [P24] 0.34-0.52 [P34] 0.48-0.72 [P48] 0.64-0.96 [P64] 0.8-1.2 [P80] 0.95-1.45 [P95] 1.4-2.1 [1P4]	1.7-2.6 [1P7] 2.2-3.4 [2P2] 2.8-4.2 [2P8] 4-6 [004] 5-7.5 [005] 6-9 [006] 7-10.5 [007] 9-13 [009]	
Applicable contactors			FJ-B06, B09, B12		
Dimensions W × H × D (mm)			45 × 49.5 × 50		

	18	25	32	40	50	65	80	95
								
								
								
								
								
	FJ-B18	FJ-B25	FJ-B32	FJ-B40	FJ-B50	FJ-B65	FJ-B80	FJ-B95
	FJ-B18/G	FJ-B25/G	FJ-B32/G	—	—	—	—	—
	4kW	5.5kW	7.5kW	11kW	15kW	18.5kW	22kW	25kW
	7.5kW	11kW	15kW	18.5kW	22kW	30kW	40kW	45kW
	7.5kW	7.5kW	7.5kW	11kW	15kW	22kW	30kW	37kW
	18A	25A	32A	40A	50A	65A	80A	95A
	18A	25A	32A	40A	50A	65A	80A	95A
	7A	9A	10A	15A	19A	26A	38A	44A
	25A	32A	40A	50A	60A	65A	100A	105A
	1NO or 1NC	1NO or 1NC	1NO or 1NC	1NO1NC	1NO1NC	1NO1NC	1NO1NC	1NO1NC
	43 × 81 × 80	53 × 81 × 81		64 × 90 × 96	64 × 90 × 96	64 × 90 × 96	77 × 110 × 111	77 × 110 × 111
	43 × 81 × 107	53 × 81 × 108		—	—	—	—	—
	SZ-A□ (2pole or 4pole)							
	SZ-AS1							
	SZ-Z1 to Z9			SZ-Z31 to Z35				
	  							

TK18B-□	TK32B-□
	
Overload and phase loss	Overload and phase loss
10A	10A
0.1-0.15 [P10]	0.1-0.15 [P10]
0.13-0.2 [P13]	0.13-0.2 [P13]
0.18-0.27 [P18]	0.18-0.27 [P18]
0.24-0.36 [P24]	0.24-0.36 [P24]
0.34-0.52 [P34]	0.34-0.52 [P34]
0.48-0.72 [P48]	0.48-0.72 [P48]
0.64-0.96 [P64]	0.64-0.96 [P64]
0.8-1.2 [P80]	0.8-1.2 [P80]
0.95-1.45 [P95]	0.95-1.45 [P95]
1.4-2.1 [1P4]	1.4-2.1 [1P4]
	1.7-2.6 [1P7]
	2.2-3.4 [2P2]
	2.8-4.2 [2P8]
	4-6 [004]
	5-7.5 [005]
	6-9 [006]
	7-10.5 [007]
	9-13 [009]
	12-18 [012]
	16-22 [016]
	20-26 [020]
	26-32 [026]
FJ-B18	FJ-B25, B32
45 × 48.5 × 61	53 × 50.5 × 61

Safety Considerations

- Operate (keep) in the environment specified in the operating instructions and manual. High temperature, high humidity, condensation, dust, corrosive gases, oil, organic solvents, excessive vibration or shock might cause electric shock, fire, erratic operation or failure.
- For safe operation, before using the product read the instruction manual or user manual that comes with the product carefully or consult the Fuji sales representative from which you purchased the product.
- Products introduced in this catalog have not been designed or manufactured for such applications in a system or equipment that will affect human bodies or lives.
- Customers, who want to use the products introduced in this catalog for special systems or devices such as for atomic-energy control, aerospace use, medical use, passenger vehicle, and traffic control, are requested to consult with Fuji Electric FA.
- Customers are requested to prepare safety measures when they apply the products introduced in this catalog to such systems or facilities that will affect human lives or cause severe damage to property if the products become faulty.
- For safe operation, wiring should be conducted only by qualified engineers who have sufficient technical knowledge about electrical work or wiring.
- Follow the regulations of industrial wastes when the product is to be discarded.
- For further questions, please contact your Fuji sales representative or Fuji Electric FA.

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